F 66/987

Preprint from the 1987

BUREAU OF MINES MINERALS YEARBOOK

The Mineral Industry of Florida

UNITED STATES DEPARTMENT OF THE INTERIOR

I 28.37/a 2:

READEX FICHE best copy available

UNITED STATES DEPARTMENT OF THE INTERIOR • Manuel J. Lujan, Jr., Secretary

BUREAU OF MINES • T S Ary, Director

This publication is a chapter from the current Bureau of Mines Minerals Yearbook, comprising *Volume I, Metals and Minerals; Volume II, Area Reports: Domestic; Volume III, Area Reports: International.* The separate volumes of the Yearbook are sold by the Superintendent of Documents, Washington, D.C. 20402.

The Mineral Industry of Florida

This chapter has been prepared under a Memorandum of Understanding between the Bureau of Mines, U.S. Department of the Interior, and the Florida Bureau of Geology for collecting information on all nonfuel minerals.

By James R. Boyle[1] and Walter Schmidt[2]

The value of nonfuel mineral production in Florida in 1987 was $1.3 billion, an increase of $56 million over that of 1986. The State ranked fourth nationally in output of nonfuel minerals with industrial minerals accounting for nearly all of the value. Principal minerals produced were cement, clays, phosphate rock, sand and gravel, and stone.

Florida remained the predominant producer of phosphate rock nationally, and with North Carolina supplied nearly 90% of the domestic phosphate rock output. The State ranked high in output of other industrial minerals, ranking first in production of peat, second in fuller's earth, third in crushed stone and masonry cement, fifth in industrial sand, and seventh in portland cement and construction sand and gravel. Additionally, ilmenite, rutile, staurolite, and zircon concentrates were produced only in Florida, as coproducts of mineral sands operations.

Table 1.—Nonfuel mineral production in Florida[1]

Mineral	1985		1986		1987	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:						
Masonry thousand short tons	316	$17,137	352	$21,269	390	$24,069
Portland do	3,282	148,908	3,189	147,643	3,565	165,944
Clays do	672	33,074	726	43,261	598	39,496
Gem stones	NA	[e]6	NA	W	NA	W
Peat thousand short tons	243	5,333	365	5,743	363	6,068
Sand and gravel:						
Construction do	[e]22,500	[e]49,500	28,233	67,898	[e]30,000	[e]74,900
Industrial do	2,123	12,642	1,467	14,930	1,884	19,713
Stone (crushed) do	69,266	287,237	[e]69,000	[e]288,200	[2]78,992	[2]350,537
Combined value of lime (1985-86), phosphate rock, rare-earth metal concentrates, staurolite, stone (crushed marl, 1987), titanium concentrates (ilmenite and rutile), zircon concentrates, and values indicated by symbol W	XX	1,007,899	XX	[r]700,919	XX	665,510
Total	XX	1,561,736	XX	[r]1,289,863	XX	1,346,237

[e]Estimated. [r]Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Excludes certain stones; value included with "Combined value" data.

Table 2.—Nonfuel minerals produced in Florida in 1986, by county[1]

County	Minerals produced in order of value
Bay	Sand and gravel.
Brevard	Clays, sand and gravel.
Broward	Sand and gravel.
Calhoun	Do.
Clay	Titanium concentrates, zircon concentrates, rutile, sand and gravel, staurolite, clays, peat.
Dade	Cement.
Escambia	Sand and gravel.
Gadsden	Clays, sand and gravel.
Glades	Sand and gravel.
Hamilton	Phosphate rock.
Hardee	Do.
Hendry	Sand and gravel.
Hernando	Cement, clays.
Highlands	Peat.
Hillsborough	Phosphate rock, cement, peat.
Lake	Sand and gravel, peat, clays.
Leon	Sand and gravel.
Madison	Peat.
Manatee	Phosphate rock, cement.
Marion	Clays, sand and gravel.
Palm Beach	Peat.
Polk	Phosphate rock, sand and gravel.
Putnam	Sand and gravel, clays, peat.
St. Lucie	Sand and gravel.
Sarasota	Do.
Sumter	Lime, peat.
Walton	Sand and gravel.
Washington	Do.
Undistributed[2]	Stone (crushed), rare-earth minerals, gem stones.

[1]No production of nonfuel mineral commodities was reported for counties not listed.
[2]Data not available by county for minerals listed.

Trends and Developments.—Florida's economy continued to be dominated by trade, service, and construction, with the construction sector a major user of mineral aggregates. The State remained one of the fastest growing in the Southeast, resulting in sustained high levels of output from construction aggregate operations.

The port of Tampa handled over 49 million short tons of cargo in the fiscal year ending September 30, 1987, up from 44 million tons the previous year. Of the cargo handled, nearly 47% was exports and nearly 98% was bulk cargo. Various kinds of bulk phosphate exports totaled 13.8 million tons, down from 14.2 million tons in fiscal year 1986. Mineral imports included cement, clinker, granite, gypsum, potash, salt, and sulfur.

Employment.—Florida's 1987 unemployment rate was 5.3%, down from 5.7% in 1986. All mineral-related sectors shared in this increase of employment. The mining sector increased about 4% while the phosphate industry increased 7%. At a high level for several years, construction increased slightly, while primary metals picked up 4%.

Legislation and Government Programs.—In response to financial problems of the phosphate industry, the Florida Legislature enacted a bill to reduce the severance tax on phosphate rock production. The act reduced the phosphate severance tax from $2.23 to $1.79 per short ton, effective July 1, 1987, with a further reduction to $1.35 per short ton on January 1, 1988, effective for 1 year. After that, the rate will be $1.35 per short ton times an index pegged to phosphate rock production.

The Florida Institute of Phosphate Research funded research on mining and processing of phosphate rock, including reclamation of disturbed lands. Funding was received from severance taxes on phosphate and was directed to beneficiation, chemical processing, and environmental, mining, and reclamation studies. A top priority for research was utilization of phosphogypsum, a byproduct of fertilizer production.

The Florida Department of Revenue reported receipts of severance taxes for solid minerals during fiscal year 1987 of $68.1 million, down from $94.4 million in 1986.

The U.S. Bureau of Mines conducted various research projects of benefit to the phosphate industry. Bureau-developed technologies included a one-stage flotation process to improve phosphate recovery, a technique to dewater phosphate slimes, and a method for recovering sulfur from phosphogypsum waste. In addition, two Reports of Investigations (RI) were also released: RI 9101, "Borehole (Slurry) Mining of Coal, Uraniferous Sandstone, Oil Sands and Phosphate Ore," and RI 9110, "Recovery of Phosphate from Florida Phosphate Slimes."

REVIEW BY NONFUEL MINERAL COMMODITIES

INDUSTRIAL MINERALS

Cement.—Shipments of both masonry and portland cement increased over those of 1986. Cement remained the third-leading commodity by value in Florida. Nationally, output of masonry cement ranked third while that of portland cement ranked seventh. Construction activities have remained at high levels in the State, keeping output at a relatively high level. Although demand was strong, prices remained steady as imports affected the domestic industry. Six companies produced portland cement at six plants. Masonry cement was produced at four plants. Cement and clinker were imported: cement through Miami and Tampa while clinker came only through Tampa. Cement imports totaled 3.6 million short tons compared with 2.5 million tons in 1986; 64% came through Tampa. Clinker imports decreased from 960,000 tons in 1986 to 880,000 tons in 1987. Cement imports came mainly from Mexico, Spain, and Venezuela while clinker came mainly from Mexico and Spain.

Portland cement shipments were predominately in bulk form by truck and rail. Major consumers were ready-mixed concrete contractors, building material dealers, and concrete products manufacturers. In-state raw materials used to manufacture cement included coral, fly ash, limestone, sand, and staurolite. Out-of-State raw materials included gypsum and iron ore. Eight rotary kilns were operated at the six plants. Five were wet process and three were dry process. Energy requirements included 406 million kilowatt-hours of electric energy, an increase over the 379 million kilowatt-hours used in 1986. In addition, other energy raw materials included coal, fuel oil, and natural gas.

Florida Crushed Stone Co. completed performance testing late in the year at its new 600,000-short-ton-per-year cement plant at Brooksville. The cement plant went on-line in February with the powerplant and lime plant scheduled for startup in 1988. General Portland Inc. started utilization of a pneumatic ship-unloading system at its terminal in Tampa. The system was permanently mounted on the dock and was designed to unload bulk carriers up to 39,000 deadweight tons at a capacity of 800 metric tons per hour.

Clays.—Common clay, fuller's earth, and kaolin were produced in Florida. Total clay output decreased by nearly 130,000 short tons while value decreased by $3.8 million. Common clay output and values decreased from those of 1986. Major uses were in the manufacture of cement and lightweight aggregate.

Four companies mined attapulgite fuller's earth at four pits in Brevard, Gadsden, and Marian Counties. Production and value decreased from those of 1986. Florida ranked second nationally in output of fuller's earth. Major uses for fuller's earth were as pet waste, oil and grease absorbents, and in fertilizers, pesticides, and saltwater drilling muds.

Kaolin was produced by one company in Putnam County; output and value increased over that of 1986. Kaolin was used where a high degree of workability was required. Main uses were electrical porcelain, whiteware, and wall tile. Also recovered at the operation was byproduct industrial sand, which was used mainly for glassmaking.

Fluorspar.—Fluosilicic acid was recovered as a byproduct of wet-process phosphoric acid manufacture at six locations. Fluosilicic acid was used to produce cryolite, aluminum fluoride, and sodium silica fluoride, and was also used in water fluoridation.

Peat.—Florida ranked first in the Nation in output of peat. But with sales decreasing slightly, unit values increased. Thirteen operations produced reed-sedge and humus peat in eight counties. Peat was shipped mainly in bulk and used as a potting soil and in nurseries.

Phosphate Rock.—Florida continued to rank first nationally in the production of phosphate rock, and the industry remained the predominant nonfuel industry in the State. Production increased slightly in 1987 after a drop of over 25% in 1986. Output still has not returned to levels attained in the early 1980's. The problems were decreased domestic consumption and a decline in exports, in the face of foreign competition. Employment in phosphate mining increased 7% as the industry picked up late in 1986. Employment remained relatively constant through 1987. To assist the industry in recovery, the State Legislature lowered the severance tax from $2.23 per short ton to $1.79 per ton, effective July 1, 1987. A further reduction to $1.35 per ton

will be effective on January 1, 1988.

The industry continued to change ownership as Agrico Chemical Co. was purchased by Freeport-McMoRan Resource Partners Ltd. W. R. Grace & Co. was purchased by Seminole Fertilizer. Beker Phosphate Corp. was acquired by Nu-West Industries Inc. Mobil Mining and Minerals Co. completed its purchase of the closed Big Four Mine from FCS Energy Inc., who had purchased it from AMAX Chemical Inc.

With the exception of Beker and Hopewell Land Corp., all the phosphate companies were operating at yearend. The companies produced at less than capacity as periodic shutdowns and reduced schedules kept output in line with demand.

In addition to the companies and mines listed in the following table, three companies recovered soft phosphate rock from hard-rock phosphate mine tailings ponds in north-central Florida. The material was sold as an animal feed supplement.

Land-pebble phosphate was produced by 10 companies at 14 mines as shown in the following tabulation:

Company	Mines	Status	Production	Exports
Agrico Chemical Co	Fort Green	Operated	Increased	Yes.
	Payne Creek	Reopened late in year		
	Saddle Creek	Closed late in year		
Beker Phosphate Corp	Wingate Creek	Closed early in year	Decreased	No.
CF Industries Inc	Hardee Complex No. 1	Operated	do	No.
Estech Inc	Silver City	do	Increased	Yes.
Gardinier Inc	Fort Meade	do	do	No.
W. R. Grace & Co	Four Corners	Closed	do	Yes.
	Hooker's Prairie	Operated		
International Minerals & Chemical Corp.	Clear Springs	do	Decreased	Yes.
	Haynsworth	Closed		
	Kingsford	Operated		
	Lonesome	Closed; reopen in 1990's		
	Noralyn	Operated		
Mobil Mining and Minerals Co.	Big Four	Closed	Increased	Yes.
	Fort Meade	Operated		
	Nichols	Closed		
Occidental Chemical Co.	Suwanee River	Operated	Decreased	Yes.
	Swift Creek	do		
U.S.S. Agri-Chemicals Inc.	Rockland	do	do	No.

Sand and Gravel.—Florida produced both construction and industrial sand and gravel during the year. Together they were the fourth-leading commodity in value among nonfuel minerals produced in the State. Total output was estimated to have increased over that of 1986.

Construction.—Construction sand and gravel production is surveyed by the U.S. Bureau of Mines for even-numbered years only. This chapter contains estimates for 1985 and 1987 and actual data for 1986. Data for odd-numbered years are based on annual company estimates.

Construction sand and gravel production was estimated to have increased over its previous record-high output in 1986. This high level of output was indicated by the sustained level of construction employment during the year.

Industrial.—Six companies produced industrial sand, one as a byproduct of kaolin mining. Output increased substantially, and the State ranked fifth nationally in output of industrial sand. Major markets were in glass manufacture and foundry sands.

Staurolite.—Florida remained the only State with a recorded production of staurolite, an iron-aluminum silicate. Staurolite was recovered as a coproduct of heavy-mineral processing by E. I. du Pont de Nemours & Co. Inc. in Clay County. Staurolite was used in foundry applications, sandblasting, and cement manufacture.

Stone.—Stone production is surveyed by the U.S. Bureau of Mines for odd-numbered years only. This chapter contains actual data for 1985 and 1987 and estimates for 1986. Data for even-numbered years are based on annual company estimates.

Florida ranked third nationally in the production of total crushed stone, second in shell, and third in limestone. Crushed stone also ranked second in mineral value in Florida with both output and value increasing. Crushed stone was produced by 86 companies at 115 quarries in 25 counties. Continued high levels of construction activi-

ty resulted in the highest level of output recorded. Florida produced dolomite, limestone, marl, and oyster shell. Uses were mainly in construction and cement manufacture. Some granite was imported through the port of Tampa for specialty uses.

Dravo Basic Materials Co. acquired a 1-million-short-ton-per-year limestone quarry at Perry from Florida Crushed Stone Co. The quarry, near Tallahassee, complements Dravo's other operations at Chattahooche and Pensacola. Dravo also will ship stone from The Bahamas to its new distribution center in Tampa.

Ideal Basic Industries Inc. was developing a limestone quarry in the Dominican Republic with plans to ship the stone to gulf and east coast ports, including Tampa.

M. J. Stavola Industries Inc. acquired Dixie Lime & Stone Co. at Sumterville and Southern Materials Corp. at Lowell. Stavola plans to construct a ground calcium carbonate facility at Lowell.

Vulcan Materials Co. formed a joint venture with Mexico's Grupo ICA to quarry stone in the Yucatán Peninsula to ship to gulf coast markets, Tampa being one of the major markets. Total investment was estimated at $150 million with an initial capacity of 7 million short tons of stone per year. Shipments were expected to begin by late 1988.

In 1985, the U.S. Bureau of Mines began compiling crushed stone statistics by districts for some States. Table 4 presents end-use data for crushed stone produced in the four Florida districts depicted in figure 1.

Districts three and four had the highest production of crushed stone, supplying over 80% of the State's output. Nineteen companies produced over 1 million short tons each and accounted for 31% of the State's production.

Table 3.—Florida: Crushed stone[1] sold or used by producers in 1987, by use

(Thousand short tons and thousand dollars)

Use	Quantity	Value
Coarse aggregate (+ 1-1/2 inch):		
Riprap and jetty stone	53	294
Filter stone	732	3,584
Coarse aggregate, graded:		
Concrete aggregate, coarse	14,980	86,245
Bituminous aggregate, coarse	4,970	25,528
Bituminous surface-treatment aggregate	975	4,522
Fine aggregate (-3/8 inch):		
Stone sand, concrete	6,045	28,073
Stone sand, bituminous mix or seal	2,320	11,403
Screening, undesignated	3,811	16,369
Coarse and fine aggregates:		
Graded road base or subbase	16,907	48,611
Unpaved road surfacing	476	1,474
Crusher run or fill or waste	4,605	10,796
Other construction[2]	2,541	7,458
Agricultural: Agricultural limestone	277	1,735
Chemical and metallurgical: Cement manufacture	1,985	8,092
Special: Other miscellaneous[3]	1,659	8,692
Other unspecified[4]	17,457	87,751
Total	[5]78,992	350,537

[1]Includes limestone, dolomite, shell, and miscellaneous stone; excludes marl.
[2]Includes coarse aggregate (large), macadam, railroad ballast, other fine aggregate, and combined coarse and fine aggregates.
[3]Includes poultry grit and mineral food, other agricultural uses, sulfur oxide removal, mine dusting and acid water treatment, and asphalt fillers or extenders.
[4]Includes production reported without a breakdown by end use and estimates for nonrespondents.
[5]Data do not add to total shown because of independent rounding.

Table 4.—Florida: Crushed stone sold or used by producers in 1987, by use and district

(Thousand short tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Coarse aggregate (+1-1/2 inch)[2]	W	W			W	W	765	3,643
Coarse aggregate, graded[2]	W	W	W	W	6,678	42,462	13,158	65,292
Fine aggregate (-3/8)[3]	W	W	W	W	1,353	5,417	10,921	50,782
Coarse and fine aggregates[4]	W	W	8,247	25,582	W	W	9,317	24,046
Other construction	67	473	1,213	9,338	5,243	14,430	1,251	2,894
Agricultural[5]	(*)	(*)	(*)	(*)	637	3,445		
Chemical and metallurgical[7]			(*)	(*)	96	429	(*)	(*)
Special[8]			(*)	(*)				
Other miscellaneous	88	399	611	6,582			1,890	7,582
Other unspecified[9]	1,209	5,286	1,329	5,820	6,868	43,302	8,020	33,343
Total[10]	1,364	6,159	11,392	47,322	20,914	169,475	45,322	187,581

W Withheld to avoid disclosing company proprietary data; included with "Other construction."

[1]Includes macadam, riprap and jetty stone, filter stone, and coarse aggregate (large).

[2]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.

[3]Includes stone sand (concrete), stone sand (bituminous mix or seal), fine aggregate (screen), and fine aggregate (screening, undesignated).

[4]Includes graded road base or subbase, unpaved road surfacing, crusher run or fill or waste, and combined coarse and fine aggregates.

[5]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[6]Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous."

[7]Includes cement manufacture and sulfur oxide removal.

[8]Includes mine dusting and asphalt filler.

[9]Includes production reported without a breakdown by end use and estimates for nonrespondents.

[10]Data may not add to totals shown because of independent rounding.

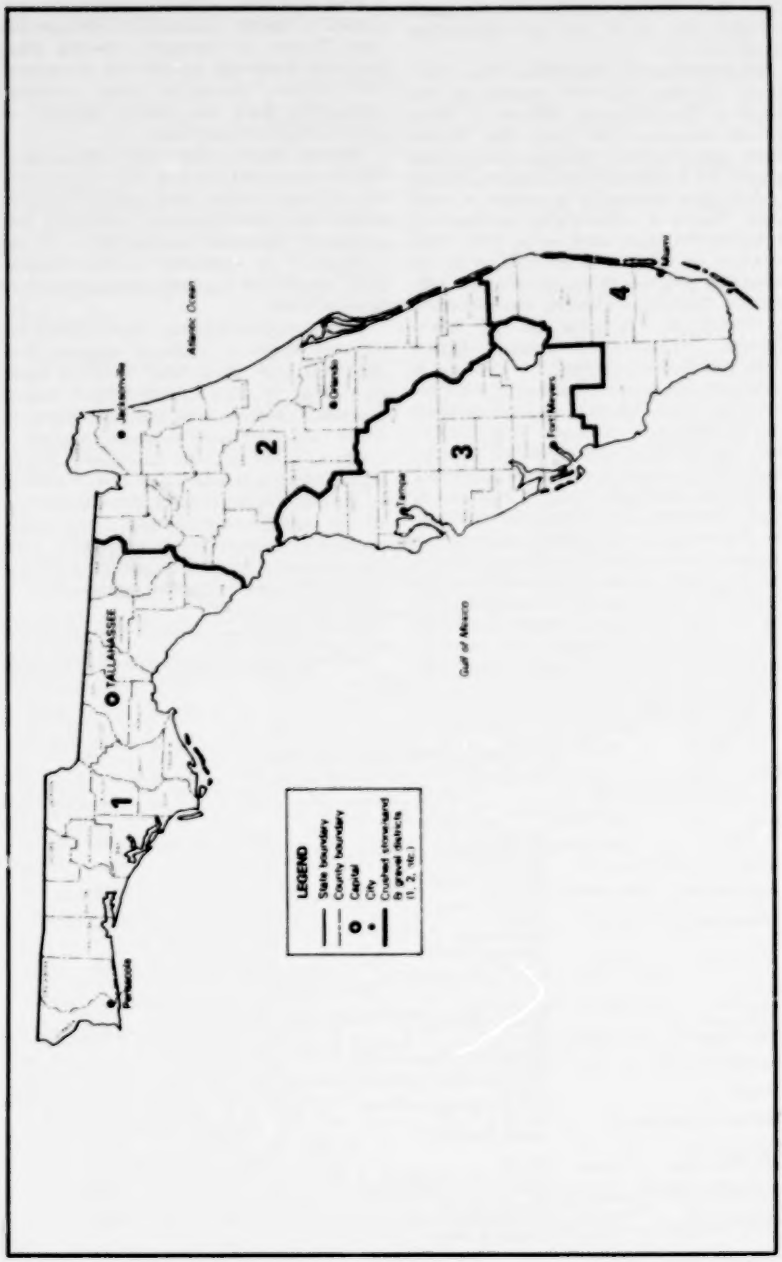

Figure 1.—Aggregate-producing districts in Florida.

Sulfur (Recovered).—Output from Exxon Corp.'s natural gas desulfurization plants in Santa Rosa County decreased for the ninth straight year as oil and gas production decreased.

Other Industrial Minerals.—Three companies calcined imported gypsum at two plants in Duval County and one in Hillsborough County. USG Corp., Jim Walter Corp., and National Gypsum Co. calcined gypsum for wallboard manufacture. Florida ranked third nationally in output of wallboard. Output of calcined gypsum remained at about the same level as in 1986. USG invested an additional $6 million in an expansion program at its facilities in Jacksonville. Byproduct gypsum was recovered by Occidental Chemical Co. at White Springs. Production decreased slightly while unit values increased. Air Products & Chemicals Inc. produced anhydrous ammonia at its Pace Junction facility; capacity was 100,000 short tons per year. Perlite from out of State was expanded by four companies; production and value decreased. Perlite was expanded at plants in Broward, Duval, Escambia, and Indian River Counties. The material was used for construction aggregate, horticultural purposes, insulation, and filler. Crude vermiculite from out of State was exfoliated by two companies at four plants in Broward, Duval, and Hillsborough Counties. Principal uses were for concrete aggregate, horticulture, and insulation.

METALS

Iron and Steel.—Florida Steel Corp. continued to operate minimills at Jacksonville and Tampa. In January, Florida Steel acquired Knoxville Iron Co. for a reported $50 million. Knoxville Iron produced reinforcing bars and had a capacity of 220,000 short tons per year.

Mineral Sands.—*Rare-Earth Minerals.*—Florida remained the only State with recovery of rare earths from mining mineral sands. Associated Minerals (USA) Ltd. Inc. recovered monazite concentrate as a byproduct of its operation in Clay County. Both output and unit values increased over those of 1986.

Titanium Concentrates.—DuPont and Associated Minerals produced titanium concentrates from their heavy-mineral sands operations in Clay County. Total output decreased. Florida was the only State in which rutile and ilmenite were produced.

Zircon.—DuPont and Associated Minerals recovered zircon concentrates from their operations in Clay County. Florida remained the only State producing zircon, a byproduct of mineral sands operations. Output decreased but still remained at a relatively high level; unit prices increased.

[1]State Mineral Officer, Bureau of Mines, Tuscaloosa, AL.
[2]State geologist, Florida Bureau of Geology, Tallahassee, FL.

Table 5.—Principal producers

Commodity and company	Address	Type of activity	County
Cement:			
Lafarge Corp	Box 22348 Tampa, FL 33622	Plants	Hillsborough.
Lonestar Florida Pennsuco Inc	Box 122835 Hialeah, FL 33012	Plant	Dade.
Moore McCormack Resources Inc	Box 23865 Tampa, FL 33630	do	Hernando.
National Portland Cement Co	Route 1 Port Manatee Palmetto, FL 34221	do	Manatee.
Rinker Portland Cement Corp	Drawer K Palm Beach, FL 33416	do	Dade.
Clays:			
Engelhard Corp., Specialty Chemicals Div	Menlo Park Edison, NJ 08817	Open pit mines and plant	Brevard.
The Feldspar Corp., EPK Div [1]	Box 8 Edgar, FL 32049	do	Putnam.
Florida Solite Corp	Box 297 Green Cove Springs, FL 32043	do	Clay.
Floridin Co	Box 187 Berkeley Springs, WV 25411	do	Gadsden.
Mid-Florida Mining Co	Box 68-F Lowell, FL 32663	do	Marion.
Gypsum (calcined):			
Jim Walter Corp	Box 135 Jacksonville, FL 32226	Plant	Duval.
National Gypsum Co	4100 First International Bldg Dallas, TX 57270	do	Hillsborough.
USG Corp	101 South Wacker Dr Chicago, IL 60606	do	Duval.

See footnote at end of table.

Table 5.—Principal producers —Continued

Commodity and company	Address	Type of activity	County
Lime:			
Dixie Lime & Stone Co [2]	Drawer 217 Sumterville, FL 33585	Plant	Sumter
Peat:			
Atlas Peat & Soil Inc	Box 3867 Boynton Beach, FL 33435	Bog	Palm Beach
Hyponex Corp	2013 South Anthony Blvd Fort Wayne, IN 46803	Bog	Lake
TUCO Peat	9001 Bear Road Sebring, FL 33870	Bog	Highlands
Perlite (expanded):			
Airlite Processing Corp. of Florida	Route 2, Box 740 Vero Beach, FL 32960	Plant	Indian River
Armstrong Cork Co	Box 1991 Pensacola, FL 32589	do	Escambia
Chemrock Corp	End of Osage St Nashville, TN 37209	do	Duval
W. R. Grace & Co [3]	62 Whittemore Ave Cambridge, MA 02140	do	Broward
Phosphate rock:			
Agrico Chemical Co	Box 1110 Mulberry, FL 33860	Open pit mines and plants	Polk
AMAX Chemical Inc	402 South Kentucky Ave Lakeland, FL 33801	Open pit mine and plant	Hillsborough
Beker Phosphate Corp	Box 9034 Bradenton, FL 33508	do	Manatee
Brewster Phosphates	Bradley, FL 33835	Open pit mines and plant	Hillsborough and Polk
CF Industries Inc	Box 790 Plant City, FL 33566	Open pit mine and plant	Hardee
Estech Inc	Box 208 Bartow, FL 33830	Open pit mines	Polk
Gardinier Inc	Box 3269 Tampa, FL 33601	Open pit mine and plant	Do.
W. R. Grace & Co	Box 471 Bartow, FL 33830	Open pit mines and plant	Do.
International Minerals & Chemical Corp	Box 867 Bartow, FL 33830	do	Do.
Mobil Mining and Minerals Co	Box 311 Nichols, FL 33862	do	Do.
Occidental Chemical Co	White Springs, FL 32096	do	Hamilton.
USS Agri-Chemicals Inc	Box 957 Fort Meade, FL 33841	Open pit mine and plant	Polk
Sand and gravel:			
Florida Rock Industries Inc., Shands & Baker	Box 4667 Jacksonville, FL 32201	Pits	Clay, Glades, Lake, Marion, Polk, Putnam.
General Development Corp	1111 South Bayshore Dr Miami, FL 33131	do	Hendry, St. Lucie, Sarasota.
E. R. Jahna Industries Inc., Ortona Sand Co. Div.	102 East Tillman Ave Lake Wales, FL 33853	do	Glades, Lake, Polk.
Silver Sand Co. of Clermont Inc	Route 1, Box US1 Clermont, FL 32711	Pit	Lake
Staurolite:			
Associated Minerals (USA) Ltd. Inc [4]	Green Cove Springs, FL 32043	Mine and plant	Clay
E. I. du Pont de Nemours & Co. Inc [4]	Du Pont Bldg. D 10084 Wilmington, DE 19898	Mines and plants	Do.
Stone:			
Florida Crushed Stone Co	Box 317 Leesburg, FL 32748	Quarries	Hernando and Sumter.
Florida Rock Industries Inc	Box 4667 Jacksonville, FL 32201	do	Alachua, Collier, Hernando, Lee, Levy, St. Lucie, Taylor.
Rinker Southeastern Materials Inc	Box 5239 Hialeah, FL 33014	do	Dade.
Tarmac Florida Inc	Box 8048 Deerfield Beach, FL 33441	Quarry	Do.
Vulcan Materials Co	Box 7497 Birmingham, AL 35253	Quarries	Broward and Dade.

[1] Also construction and industrial sand and gravel.
[2] Also crushed stone.
[3] Also exfoliated vermiculite.
[4] Also titanium concentrates.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1989—242-377/81005